The Builder.

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SATURDAY, MAY 29, 1852.

"Young Architectural Student" (we hope he is a *very* young one) writes to ask us if it be desirable that he should get any knowledge of "natural philosophy, chemistry, and such things?" He does not think it is, himself. He does not care, he says, about air or steam, or affinities or cohesion,—knows nothing about matter, and is not concerned as to the laws which regulate it,—thinks the study of these things must be dull work, and intends to "stick to drawing." It is not the first time we have received such an inquiry, strange as it may seem in these days of elementary treatises and universal lecturings; and not long ago, in the course of conversation with a pupil who had really distinguished himself in an artistical point of view, we found him ignorant of the commonest elements of physics. These are, without doubt, exceptions; but small as the number whom they represent may be, our readers generally will perhaps pardon us for addressing a few words to the "young student," and referring to two or three every-day phenomena with the view of awakening his attention to the stores of interest open to him, and leading him to think.

Not only is it "desirable" you should get knowledge of this sort, but it is absolutely necessary. A general knowledge of the leading sciences is now so universally possessed, that ignorance of them in any one is a positive disgrace: to the title of architect, especially, you could, without this knowledge, have no claim. Irrespective of its importance to you professionally, it will give you fresh eyes: without it you cannot see what you look at: with it you may see, literally, through a millstone: all Nature's processes are opened,—every substance speaks.

What is that you have just now put your hand on? A piece of timber. Yes; but do you see that it is simply a mixture of oxygen, hydrogen, and carbon. In good dry timber, free from resin, you will find the exact proportionate weights of oxygen and hydrogen required to form water, combined with an equal weight of carbon. In an oak weighing 30 tons, there are consolidated, we are told, 15 tons of water, and 15 tons of carbon or charcoal.

We must take care, you will say, not to put our timber under circumstances calculated to destroy the connection between the elements composing it. The deduction is as important as it is obvious. And whence, think you, has this mass of carbon been collected. From the earth? No; from the air, and the air alone. "I see nothing in the air." True; yet every 10,000 parts of it contain ten of carbonic acid, and vegetables have the power of decomposing this, and taking to themselves the carbon,—carbon which is the substance of the diamond, the substance of sugar, the substance of meat! Clever and omnipresent carbon!

You do not *see* the air, you say; but you know it has weight and bulk. You surely know the principle of the barometer, and how an ordinary pump acts? If you feel obliged to say "No" to this inquiry, do not go to bed till you can say "Yes." It will not keep you up very late.

And before you put your Candle out, look at it. It has been burning some time unsnuffed, and gives little or no light: the wick is long, and is topped by a heavy black clot,—a lump of unconsumed carbon. Take the candlestick in your hand, and move it gently from side to side: the superfluous wick burns away, and the candle is again bright. When you ask yourself why this is, you learn that flame is hollow, and as it admits no oxygen, which is necessary for combustion, the wick which it surrounds remains unconsumed, and diminishes the light. When the flame, by motion, leaves the wick exposed at intervals to the oxygen of the atmosphere, it speedily burns away. Note the valuable deduction from this fact,—the formation of a wick which constantly turns outward and reaches the exterior air, and so gives us a candle requiring no snuffing. There is much philosophy in the burning of a candle. The wick you may think is intended to burn and give light; but this is not exactly the fact. The wick is simply to bring the melted tallow, or oil if in a lamp, into that finely divided state in which it is best fitted for combustion. The heat applied to "light" the candle decomposes into its constituents the small quantity of tallow next the wick: heat and light are produced in the operation, and the heat so produced carries on the decomposition. Just think of this.

The effect of heat will be the "because" to many of your "whys." You passed the plumber's pot of solder this morning, and the metal was a solid mass. Apply heat and it becomes fluid: the substance of heat, *caloric*, insinuates itself between the particles of matter, and destroys, to a certain extent, their cohesion. Take a lump of ice: a certain amount of heat separates its particles, and it becomes what we call water: give more heat, and the atoms, further separated, take the form of steam, and fly asunder with such force that, confined, they would split the *globe*—irresistible. Returning for an instant to our solder, the workman will tell you that it is made of tin and lead melted together, and the advantage of this mixture is, that it melts at a lower heat than either of these materials separately: the cohesion of the atoms of lead to atoms of tin offers less hindrance to the operation of heat than the cohesion of lead to lead, or tin to tin.

And these atoms of which you speak, you may say, what are they? It is difficult to arrive at them, except in the mind, so minutely divisible is matter. You may easily get an idea of this. Take water, for example: Newton shows that the thickness of a soap-bubble at a particular point, is the 2,500,000th part of an inch, and that this has all the properties of water as essentially as the Mediterranean: the ultimate molecules forming water must of course have less dimensions than this thickness. We can beat gold so thin that a leaf of it is but the 282,000th part of an inch in thickness. An ounce of gold, by wire-drawing, may be divided into 432,000,000,000 parts, and each part will still possess all the characters and qualities of the metal. A small lump of sugar will sweeten each of the 30,000 drops forming half a pint of tea, and if the point of a needle be inserted in one of these drops, it will bring away a film of moisture without lessening the apparent size of the drop, perceptibly sweet, and containing, therefore, a portion of this 30,000th part of the lump too minute to estimate. And yet there are, probably, ultimate molecules of defined figure!

The slaking of lime, the setting of mortar, glass, bricks, properties of fluids, all suggest inquiry. We sought long ago, by a lengthened series of papers in our journal on Chemistry, as applied to Construction,* to awaken our younger readers to the importance of the study of the sciences, and the sources of delight which it opens. Of all the properties of fluids, that of transmitting pressure equally in *all directions* is the most important, and the most attractive to a young inquirer. You can scarcely be ignorant of the fact that, if, for example, into a vessel of water, a pipe be introduced, having the magnitude of a square inch, containing a pound of water, pressing upon the water in the vessel, the force it will exert is not one simple pound, but one pound upon every square inch of the surface of the interior of the vessel. When abstract science had discovered and investigated this law, practical science applied it in the shape of what is known as the Hydrostatic Press.

And here let us caution you against the common error of supposing that it is practical science alone which concerns and benefits Industry: practical science is but the application of abstract truths. As Playfair properly remarks, "the discoverer of abstract laws, however apparently remote from practice, is the real benefactor to his kind; in reality far more so than he who applies them directly to industry. Yet, in our mammon-worship, we adore the golden calf, and do not see its real creator. It is abstract and not practical Science that is the life and soul of Industry: practical appliances are the organs through which the God-born truths pass for the sustenance of its general frame."

It is the men who are looking for and eliciting great truths, careless as to whether they will have any immediate effect in increasing the resources, enjoyments, and comforts of men, that are providing arms for the coming generation, to achieve their triumphs in the industrial struggle of nations. We are getting, however, a little past what we started with, and will pause. We say to our young student again, learn how to observe: get a knowledge of Nature's laws, that you may be able to see properly Nature's works. Learn, too, to think. Thought begets thought, and you may draw on your own mind without much fear of exhausting it, if you have taken means to bring it into a proper state for service. Do not be afraid of your own thoughts: fear rather too great a dependance on those of others, which may prevent you from ever getting a thorough knowledge of what you are really capable of. Get knowledge, and then give your own mind fair play: THINK!

Caution to Builders and Drivers.—At the end of last week Mr. Godwin, the conductor of this journal, was knocked down by a cart, driven by a boy, at the corner of New Cannon-street, in the City, where it crosses Queen-street. The wheel went over his leg: and though, providentially, it did not break the bone, inflicted painful injury. A pile of earth had been thrown out beyond the hoarding for a new building there, and being close to this when the cart came upon him, escape was impossible. We mention the occurrence, simply that it may serve as a caution as well to builders as to those who give the charge of vehicles to incompetent and improper hands.

* Vol. V.

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